ON PRESERVATION

OF

HEALTH IN INDIA

A Lecture

ADDRESSED TO THE ROYAL INDIAN ENGINEERING COLLEGE AT COOPER'S HILL

BY

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GENTLEMEN,—It having been intimated to me that some information about the climate, mode of living, diseases, and best method of preserving health in India would be acceptable to you in the form of a lecture, I have great pleasure in undertaking that duty, and will endeavour to impart to you some of the experience that I have gained in such matters during a long residence in that country, and which will, I trust, both interest and instruct you.

Colonel Chesney has made some important observations that I venture to quote as the text of what I am about to say in reference to the important question of health, and what you should do in India to preserve it.

He says,—"I have been very much struck with the amount of sickness to which our young engineers appear to be subject. A certain excess over the English average is of course to be expected in India, and engineers in particular are subject to exposure and malarious influence in an exceptional degree, but the number of cases of ill-health among these young men seems to be altogether beyond what might be set down reasonably to these causes. It is probably due, in part, to their being very much detached. A young officer on going to India joins his regiment, and learns from his brother officers how to take reasonable precautions. So the young civil servant gets the advantage of the example of his seniors at the station to which he is

posted. But the young engineer very often has no such guidance, and loses his health before he has learnt prudence.

"The matter is one of some importance. The accounts which have lately come home of sickness among them is really distressing. And more than one of them, in writing to us here, has deplored his want of a little elementary medical knowledge, not only on his own account, but from his inability to treat his work-people with the most simple remedies when out with them alone in the jungle."

I am aware that to gentlemen of your education and attainments much of what I shall say may seem trite and common-place, but as it is best for my purpose to do so, I shall assume that you are practically unacquainted with the subject, and treat it accordingly.

Few people, I imagine, who have not been there, appreciate the importance, or realise the vastness of British India. Let me remind you of some prominent facts relating to the country in which your future career is to be spent.

That extensive portion of the British dominions which gives to our Queen the title of Empress, and is called "the brightest jewel in her crown," is the great central and southern promontory of Asia, lying between the fifth and thirty-fourth parallel of north latitude, and the sixty-sixth and ninety-seventh meridians of east longitude. It includes a portion of Afghanistan in the north-west, and part of the country on the eastern side of the Bay of Bengal, extending from Chittagong to Tenasserim as far south as the tenth parallel of north latitude, and has a coast line extending for more than 4000 miles. It is about 1900 miles from Peshawur to Cape Comorin; and about the same distance from Sudya—a frontier post in Assam, to Kurrachee, at the mouth of the Indus; from Bombay to Point Palmyras in Orissa it is 900 miles. The superficial area is above 1,600,000 miles,—equal to the whole of Europe, excluding Russia, and three-fifths are directly under British rule.

The geographical boundaries are well defined, on the north by the Himalayas, a chain of stupendous mountains 150 miles in average breadth, the highest in the world, running north-west and south-east in a crescentic manner for 1600 miles, with a mean height of 16,000 to 20,000 feet; Mount Everest and Kinchinjunga, the loftiest peaks, being 29,000 and 28,000 feet above the sea level. This barrier, which separates India from Turkestan and Tibet, is crossed by passes 17,000 feet above the sea level, nearly as high as the line of eternal snow.

On the north-west it is bounded by the edge of the plateau of Afghanistan and Beloochistan, and by the Suliman and other mountain ranges; on the north-east by the heights of Assam, dividing the drainage of the Brahmaputra from that of the Irawaddy. It is separated from Burmah and Siam by the Youmadong and other mountains, whilst its coasts have the Bay of Bengal on the east, and the Indian Ocean and Arabian Sea on the west.

This extensive but compact country has nearly two hundred and fifty millions of inhabitants, composed of races more numerous and ethnically distinct, and speaking languages more numerous and varied than those of Europe; whilst, from the nature of its physical geography and the extent of its area, it has every kind of climate, varying from that of the Torrid to the Arctic zone. The seat of the most ancient civilization, with a history that reaches far back into remote antiquity; possessing a fertile soil, lofty mountains, elevated table-lands, rich alluvial valleys, extensive desert tracts, and plains; noble rivers, extensive swamps, jungles, and magnificent forests; a rich Fauna and Flora, wealth of mineral, vegetable, and animal products, and many undeveloped resources; it has characters that invest it with peculiar interest, especially for those who spend the best part of life there, and on whom the responsibility of ruling it has fallen.

A country with such physical characters has many distinguishing features of climate that are strange to the Anglo-Saxon, who has necessarily much to learn before he is acclimatised and adapted to his new home. The people

and their habits, the animal and vegetable creation, even the diseases, differ from those he has hitherto known, and he makes acquaintance—let us hope, not in his own person—with malarial and liver disease, insolation, dysentery, cholera, and others that at times sweep over the country as destructive epidemics, whilst the conditions of life generally under which he exists differ from those of more northern regions.

Such is to be your home and the scene of your labours; it is a field that has, as yet, been only partially explored, but which offers prospect of a rich return to those who work in it. Now, to enable you to take advantage of this, health is essential; but I regret to learn that of those who have already gone there, some have suffered, in this respect, beyond what may fairly be ascribed to climatic causes alone. It is on this account that I am here to-day, for the purpose of assuring you that health, though more precarious than at home, is not necessarily so seriously imperilled as you might suppose, if only ordinary precautions be taken,—to offer you, in short, some advice as to how you may preserve it, and avoid, or mitigate, whatever is injurious.

But as having an important hygienic bearing on the subject, let me first say a few words on the climate, seasons, and some other matters that affect the health of Europeans generally in India.

The Englishman has naturally a great power of adapting himself to altered conditions of existence—to extremes of temperature, and to climatic change. Like some of the domestic animals he has taken with him, he exists, nay, thrives, among the ice of the Polar regions, or under the vertical sun of the Torrid zone. This power of endurance is often severely tested, but the strain is sometimes due more to himself than to his surroundings, still there can be no question that, with care, it may be much enhanced. It is reported of an Irish soldier that he said, in reference to the evil effects of climate on his comrades—"They eat and they drink, and they drink and they eat, till they die, and then they write home and say it was the climate that killed

them." The soldier was not so far wrong in his estimate of the share climate takes, though he put it "more Hibernico."

In these days of expeditious travelling men are transported rapidly from one extreme to the other, the sudden change is itself a severe trial, and, if incautiously undertaken, may lay the foundation of a chronic intolerance of the climate. I shall never forget the suffering I endured on arriving in Calcutta in the end of April, when the thermometer was at 90° in a damp atmosphere, after leaving England in March in a snow-storm with frost on the ground. I have often endured great heat before and since, but never felt it as I did on that occasion, when physical and mental energy were alike depressed and almost prostrated by the sudden change. I do not know when the exigencies of the service may require you to go to India, but I would say that it is very desirable that Indian life should commence, if possible, in the cold season; by so doing the prospects of tolerating the climate will be much increased. Let me say at once that a young Englishman starting with fair health, good habits, and freedom from tendency to organic disease, may live well and happily in India, find scope for the full development and exercise of his physical and intellectual energies, and return to England, after long service, able to enjoy life, and to work as well as others of his own age and, probably, not half his experience. But this will depend very much on how he has taken care of and adapted himself to the varying conditions of life in the tropics.

India, for our purpose in regard to climate, may be divided as follows: 1st, The Himalayan, with Bhotan, Nepal, Gurhwal, and Cashmere dividing it from the 2nd, or Hindostan, which extends along the foot of the Himalayan range, and includes the alluvial plains of the great rivers Brahmaputra, Ganges, and Indus, with their numerous tributaries, and part of Central India.

3d. Southern India, the Deccan—which consists of elevated plateaux, from 1500 to 3000 feet above the sea-level, littoral plains, intersected by numerous rivers, mountain ranges, and isolated hills; the Vindyah chain, covered with

forest vegetation, with its offset, the Satpoorahs, traverses the continent from the Eastern to the Western Ghauts (the latter rising from 5000 to 7000 feet), which bound it on either coast. The climates of this vast territory, correspond to latitude, elevation, and physical characters of the country. Northern India is extra tropical and less influenced than the Deccan by the periodic winds, which bring moisture more or less to the whole Peninsula.

The climates in which you may have to serve will, therefore, vary. In Northern India you may find yourself in one nearly as good as any in Europe; elsewhere, you may happen on that which seems barely compatible with life itself. Heat alone, however, is not the only objection, for almost everywhere there is added malaria, with whose effects all, sooner or later, are only too familiar. It is the cause of more sickness and invaliding than almost all other disease causes put together; and often never entirely ceases to manifest its effects on the constitution!—Life is maintained under more or less of a struggle, and I propose to show you how the contest may be successfully maintained.

The heat is also greatly modified by moisture, and the effects of a dry or a damp atmosphere at the same temperature are very different. Dry air in motion at the temperature of 100° is more tolerable than that at 75° or 80° when stagnant and loaded with moisture! The hot winds of Northern India are more endurable and often healthier than the cooler but saturated atmosphere of lower Bengal, or parts of Southern India. Varieties of climate need corresponding adaptation of modes of living, as you would sooner or later learn by experience; but I would have you prepared at once to frame your life in accordance with its surroundings.

The mean temperatures of the following stations are:—

CALCUTTA, 8 feet above sea-level, is in May (hottest month) 89°; January, 70°; but it ranges between 45° in the coldest, to 92° in the hottest months.

MADRAS, sea-level, June (hottest), 88°; January, 76°. Range, 72° to 92°.

BOMBAY, sea-level, May (hottest), 86°; January, 74°. Range moderate.

PESHAWAR, 1056 feet above sea-level. June and July (hottest), 91°.; January, 52°. Range great.

PUNJAB, 900 feet above sea-level. June (hottest), 89°; January, 54°. Range, from frost to intense heat, 110° and more.

BANGALORE, 3000 feet above sea-level. May (hottest), 81°; January, 69°. Range moderate.

POONAH, 1089 feet above sea-level. May (hottest), 85°; January, 72°.

BELGAUM, 2200 feet above sea-level. April (hottest), 81°; May, 78°; June, 75°; December (coldest), 70°.

The coldest months are December and January; the hottest, April, May, and June.

There are fluctuations in temperature owing to hot, dry winds, sea and mountain breezes, which give local peculiarities of climate; but it may be said, generally, that there are three distinct seasons in India—the hot, the rainy, and the cold, which vary in duration and time of setting in; but approximately the cold season extends from November to March, the hot from March to June or July, and the rainy season from that to October or November. They do not pass abruptly into each other; between each there is a transitional period.

The seasons are greatly influenced in their course and regularity, by the monsoons.

The south-west monsoon commences with storms of thunder and wind on the Malabar coast in May, and reaches regions further north later in the year. The Carnatic and Coromandel coast, sheltered by the Western Ghauts, is then exempt.

About Delhi and in the north-west it begins towards the end of June, and the rainfall is greatly diminished. In the Punjab, near the hills, the rainfall increases; but in the Southern Punjab and in the great desert regions there is very little rainfall. There are belts or tracts of country commencing in Scinde and the N. W., with a rainfall varying from two inches up to some hundreds, the highest being at Cherra Poonjee, where 600 inches fall; next to this the Western Ghauts have the greatest rainfall; at Mahablesh-

war, 253 inches; on the Tenasserim coast it is 180 inches.

In places near the sea, where the land is low and the temperature high, very little rain falls, as at Kotah in Scinde, where it is only 1·8; or at Kurrachee, where it is 4·6 inches in the year. In inland districts, where the monsoon has lost much of its moisture, as at Peshawar only 13·8 inches fall. The rainfall in Calcutta is 56·8; in Madras, 50; in Bombay, 72·7; in Delhi, 25·1; in Meerut, 18; in Punjab, 56·6; in Benares, 37; in Bellary, 21·7; in Bangalore, 35; in Poonah, 27·6; in Belgaum, 51·5; in Kamptee, 21·8.

The amount of humidity in the air varies greatly. Flat hot plains like Scinde, where there is little or no rain, have an atmosphere almost saturated. Some of the lower mountain ranges, Bengal and many districts near the coast in Southern India, are very damp. The elevated table-lands of the Deccan and Central India, and the hot sandy plains of North-West India, have a dry air, and during the months of May and June, in the latter, it blows like a furnace blast, being heated and desiccated by the hot plains over which it has passed.

The north-east monsoon commences in October, and is attended with dry weather throughout the peninsula generally, except on the Coromandel coast, where it brings rain from the Bay of Bengal, over which it blows, between October and December.

In the hill stations of Darjeeling, Missoori, Nainee-tal, Murree, Simla, and generally in the elevated provinces of the lower ranges of the Himalayas, also at Ootacamund, Conoor, Wellington, Mahabaleshwar, in the Neilgherries and Ghauts, stations at elevations of five to seven thousand feet, Europeans enjoy a climate as genial and healthy in summer, and almost as bracing in winter, as in Europe. These are favourite health resorts, and will probably become the sites of future colonization, for it seems probable that there the European will thrive and continue to reproduce his race; while, it is said, that after the third generation his progeny would cease to exist in the plains.

The meteorological conditions and physical characters I have described influence the seasons as follows :—

In Bengal the cold season begins about the middle of October—the days are hot, but the mornings and evenings are cool. The wind is northerly, the air is dry and bracing, the sky bright, though still there may be cloudy days, and occasional showers—the last traces of the monsoon. In November and December the weather is cooler, the north-east wind is fresh and sharp, and the air dry ; there are heavy dews at night, dense fogs are apt to prevail, the thermometer ranging from 56° to 78°. About Christmas a few showers occasionally fall. January is colder, the air is bright and keen, fogs are frequent ; one may be out all day in the open air, but it is always necessary to protect the head against the sun's rays. The thermometer falls to 46° or lower, and rises to 75° or 76°. Until the middle of February the weather is delightful, but it then begins to get warm at mid-day. During these months the climate is most agreeable, and those who have been in camp will tell you that nowhere is there a more healthful and delightful season. It is strengthening to the system exhausted by heat and moisture ; the appetite and strength return, and the frame becomes reinvigorated and elastic—but there is risk of visceral congestion, thoracic complaints, bronchitis, etc.

In March, the hot weather sets in. The sun is powerful, though the nights are still cool. Atmospheric disturbances, called north-westers, with heavy showers, now cool and freshen the air, and are sometimes accompanied by thunder and hail. Thermometer ranges from 70° to 85°, or higher. In April and May the weather becomes intensely hot, but there are occasional showers and storms, that relieve the oppressive state of the air, which is generally hot and muggy—so damp as to prevent evaporation—the skin becomes clammy with perspiration, and irritable from the eruption of prickly heat. The thermometer ranges from 80° to 90°, or higher. The weather is intolerably oppressive, and at nights so close that it is difficult to sleep. The constitution becomes irritable, the nervous system depressed; weakly persons, and

especially those who are of intemperate or irregular habits, suffer severely, and not unfrequently succumb to heat, apoplexy, or asphyxia.

There is tendency to fevers and liver complaints. In the commencement of the hot season—February and March—cholera is apt to appear in Calcutta, and what is called the endemic area in Bengal, where, perhaps never quite extinct, its visitations are then most severe. Towards the end of May rain often falls, and is known as the "Chota Bursat," or lesser rains; but frequently the hot muggy weather continues to June without rain till about the middle of the month, when the south-west monsoon sets in with thunder storms and heavy showers, settling down into heavy rains, which bring the much-longed-for relief, and clothe the earth with verdure; the air is now cooler but saturated with moisture; this continues until October, when the rain abates; the winds become variable, and during, if not before, September, rain ceases; the air is very damp and oppressive, and it is at this season that the European constitution suffers most—depressed by the previous heat and damp, it is more than ever oppressed by the hot steamy atmosphere in this unhealthy season, when malarious diseases, hepatitis, dysentery, fever, spleen, boils, and other torments are apt to occur. During the drying up of the moisture malaria is evolved and active; the vital powers are low and the constitution is readily affected by it.

In the north-west and Punjab the same sequence is observed, but modified by latitude and physical characters of the country. The winter is colder and prolonged into spring, but the sun is powerful, the air dry and bracing, and life in the open air is pleasant. The rains are later, and in some tracts are very scanty, while the hot winds in May and June are so intense that the thermometer will rise to 110° or higher in the shade, and were it not for the effect of perspiration in cooling the body, life would often be in danger. Indeed, natives as well as Europeans succumb to the Loo-marna (hot wind stroke), as it is called in Hindoostanee. Barring this direct action of great heat, however, it is not unhealthy, and with care a high state of health may be preserved.

The heat must be mitigated by the punkah, or tempered during the hot winds by the tattie and thermantidote.

In Southern India the climate varies with the peculiar features of physical conformation. The sea coasts below the Western Ghauts are hot, wet, and steamy; the elevated plateaux are dry or moist according to their proximity to the Western Ghauts. The Carnatic is hot and dry. The thermometer at Madras ranges from 72° to 92° or higher. The delightful cold of Bengal and Northern India is unknown there. The ordinary diseases of the tropics prevail, and liver disease is nearly twice as frequent as in other parts of India. One great compensation, however, it has in its sea breezes and the proximity to the delightful climate of the Neilgherry hills.

Bombay is a hot, steamy place, built on a muddy, unhealthy site; but it has been improved, like Calcutta, by sanitary works, whilst its proximity to the elevated plateau of the Deccan, and hill stations, its charming scenery, and the sea, make it a favourite place of residence.

Such is a brief sketch of some of the physical characters of India, and of its climate and seasons. This was necessary as introductory to the question of health, to which I now pass on.

We have now to consider how you are to guard yourselves against adverse influences, so as to obviate the deleterious action of the climate, and preserve health; how to act in case of disease occurring to yourselves or others, where medical assistance is not immediately available. The difficulties against which you will have to contend will be chiefly those due to extremes of temperature, dryness, moisture, and miasmata. Heat and cold are relative terms, and you are likely to suffer from cold in a hot climate, especially if it be a variable one. The power of tolerating climatic influences is great, if care be taken to observe simple hygienic rules.—Avoid exposure to obvious causes of disease; attend to the nature of the food, drink, clothing, lodging, moderate exercise, work, and recreation, and submit to the moral and physical self-discipline that preserves mind and body in a state of just equilibrium. When I am

asked, as I often am, how a young man should live with the view to preserve his health in India, my advice is that he should live temperately in all things, always wear flannel next his person, avoid exposure to the direct rays of the sun, and notoriously miasmatic localities. Go to bed and rise early; eat moderately, and at regular hours; smoke and drink as little as possible; and guard against giving way to passion, excitement, or the irritability of temper so easily acquired in hot climates. Check immediately all tendency to bowel complaint or other acute symptoms. Avoid idleness, and its consequent ennui, on the one hand; and over-work, mental or physical, on the other. Let him do this, and he may hope to enjoy health, and serve out his time with advantage to himself and the service.

I have already alluded to the importance of beginning life in India in the cold season. From October to February, or even March, is the best time; but the earlier the better, for at all other seasons the Red Sea and the Indian Ocean are so oppressive, that you might arrive in India with the seeds of mischief already sown. I do not say it is *impossible* to go during the hot, but that it is better to do so in the cold, season.

Suppose, then, that you have arrived in India in good health, and at the best season of the year—that you are placed in an isolated position, where you have only yourself to rely on, and no one from whom to seek counsel or aid. Your first enemy will be the sun, which even during the winter months has great power. Avoid exposure to it as much as possible after the early morning and before the evening hours. Never go out without a good hat made of solah (pith) or other light material, and envelop it with a puggrie. The head, temples, back of the neck, and spine, should be protected. If you have to be out in the sun in the hot months, protect the spine by a pad of cotton or cork, 4 or 5 inches broad and 12 or 14 inches in length. It is well, also, to have an umbrella, which should be covered with white calico to make it more impervious to the sun's rays. During the very hot hours of the day, some green leaves, or a light pad inside the hat;

wetting the puggrie or even the hair, will add to the protection against the heat. Your clothing should be light, but not too light, as a certain amount of substance is desirable to keep out the heat; and light woollen or cotton is the best material. One point I would particularly urge as *most* important: it is, never, under any circumstances, omit to wear flannel or light woollen under-clothing. I regard this as a point of cardinal importance, and never to be disregarded. Understand that the object of wearing it is not to keep you warm, but to equalise temperature, and prevent chills. During the action of the skin, the body clothing, if of cotton or linen, becomes wet with perspiration, and the first draught of air that brings it in contact with the skin causes a chill, and the evils that may follow are numerous. An extra precaution, sometimes of great value, is the so-called cholera-belt, a band of flannel worn round the abdomen to protect the abdominal viscera from sudden changes of temperature. In many parts of Northern India the cold of winter is severe, and the warmest English clothing will barely protect you. Young men in the vigour of health are apt to neglect and despise these precautions, but I assure you that, as matters of personal hygiene, their importance cannot be over-estimated, as a few minutes' exposure of the head to a hot sun, the laying aside of underclothing because it is hot at night, may lay the foundation of serious mischief.

Exposure to the direct solar heat, or to a high temperature in the shade, may induce heat asphyxia, sunstroke, ardent fever, or other evils of a more insidious character, by injuring the nervous system, increasing irritability, depressing vital energy, and affecting the internal organs, especially the liver, which has already extra work, in eliminating waste products, and in compensating for the diminished respiratory excretion of carbonic acid through the lungs, the consequence of breathing a more rarified and therefore less oxygenated atmosphere.

The blood becomes deteriorated, there is a tendency to liver affections, fever, boils, and a variety of ailments, and the general health fails. All are not so affected, for many live for

years apparently uninjured by the heat ; but as a rule the European does at length become debilitated, and needs change to a cooler climate, which he should take, if he can, after six or seven years. Stimulating or rich food, and alcoholic drinks, should be avoided, or taken in extreme moderation, and the punkah, thermantidote, or tattie should be resorted to. Ventilation of dwellings, and especially of sleeping rooms, should be attended to ; and, if possible, the latter should be raised above the ground level. It may seem paradoxical to say so, but cold is more to be dreaded at this time than heat, for chills and draughts are most pernicious, and one is never more prone to suffer from them than when bathed in perspiration. A current of air, or the fall of temperature from any cause, and above all, the neglect of woollen under-clothing, may give rise to chill, and fever, liver, dysentery, diarrhœa, or rheumatism may be the result. I have known serious illnesses caused by sleeping in a draught, or in the cold air coming from a thermantidote, or from the sudden chill caused by the punkah pulled suddenly after it had been stopped by the coolie falling asleep. It is well to sleep in a light flannel suit, in order to protect yourself from such chills. In the great heat, people sometimes endeavour to get rest by sleeping in the open air, but this is a dangerous practice, unless in very dry climates, and should be deprecated. The punkah is an indispensable apparatus ; it consists of a frame-work of wood and canvas, with a fringe which is swung backwards and forwards from the ceiling by a rope passing over a pulley, and drawn by a coolie ; by putting the air in motion it communicates a feeling of coolness that is very grateful, and indeed, without it in some parts of India, the heat would hardly be endurable.

The thermantidote is a machine through which, by the rotation of a wheel and fans, a current of cooled air is drawn into the room ; and with the tattie, which is a frame filled with khus-khus, a fragrant grass, is much used in the dryer parts of India, where the rapid evaporation of the water sprinkled on the grass, produces a great fall in the temperature. For example, in May, in Oude, with a hot

west wind, the thermometer stood in shade 104°, in house 83°; behind the tattie 68°.

The direct action of the sun, or of a very high temperature in a damp atmosphere, whether by day or night, in some cases causes very dangerous symptoms, as I have already stated, often resulting, after partial recovery, in permanent injury to the cerebro-spinal system. Those, especially, who are debilitated or intemperate, are in danger, as is often sadly illustrated in the hot oppressive nights of May and June in close rooms, in railway carriages, and the like, in Bengal and other parts of India. In the dryer atmosphere, where the natural refrigerating powers of the body are lowered by disease or intemperance, many succumb during the hot winds, though less frequently in the case of those who live carefully and take ordinary precautions.

With regard to diet, I have only to say that it should be plain and simple: for new arrivals it is better to abstain from *much* animal or stimulating food, with the view of avoiding plethora, dyspepsia, mal-assimilation and congestion of the already overtaxed liver and eliminating organs. Whilst enjoining moderation, I do not mean that I advise you to copy the natives of the country entirely in their food: you cannot altogether change your mode of living or the character of your aliment. Your stomach will no more obtain from the diet of a Hindoo all that is necessary for nutrition, though it may contain it, than it could in other circumstances from the blubber that delights whilst it nourishes an Esquimo. Habit, in these things, becomes hereditary, and our machinery is not adapted for sudden changes. But the principle is sound, and the food should be modified to suit it to changed circumstances.

As a general rule, people eat too much in India—more than they can assimilate, or is needed for nutrition. The consequence is, disordered digestion, faulty assimilation, disordered liver, bowel complaints, and the presence of effete matter in excess in the blood. Take a cup of tea before your morning ride or walk if you will; a plain breakfast of tea, coffee, bread and butter, eggs, or even a

bit of chicken, at 9 or 10 (you really do not need more than the bread and butter); lunch or tiffin at 1 or 2 P.M., with very little animal food, a cutlet or leg of a fowl, with vegetables, will suffice, and a glass of light wine or bitter beer if you really feel that you must take some stimulant, though, I firmly believe, that, for young men, it is unnecessary. People generally dine in the evening; so will you probably. This will be the principal meal of the day; see that it be a judicious one—the simpler and plainer the dishes the better. The good old maxim of "leave off with an appetite" you will do well to observe. It would detain me too long to discuss particular articles of food—that may well be left to your discretion; but I would impress on you the importance of the physiological reasons for being abstemious. As to wine, beer, and spirits, I would say that, freely admitting there may be circumstances in which they are required, and recognizing the fact that a certain quantity is taken with pleasure, and even benefit, by some, it is, at the best, an acquired want that does not originally exist in healthy young men (and you have no business to go to India if you are not healthy), and that, whatever may be said on other grounds, it is not *a necessity*. If you can abstain from alcoholic stimulants, excepting when they are prescribed by the physician, I am as certain that your chances of living and thriving in India will be greatly enhanced, as that I am telling you so! Supposing, however, that you cannot, or will not, abstain, I advise you to prefer light wine, such as claret, to beer, beer to spirits. Avoid the last as much and as long as possible. Brandy and soda water is called a "peg" in India—some one said because each one was equivalent to a peg in the coffin. This is taking a sensational view of the subject, but there is a substratum of truth in it. You see I am not an advocate of stimulants, outside of medicine, and I believe that I am right. I have little faith or sympathy with the common excuse of bad water: it is not as a rule made better by mixing it with alcohol. I would repeat, if you really need a stimulant, let it be of the simplest and purest kind, and never, under *any pretext*, take it *before lunch*.

As to smoking. It may be pleasant, but it is unnecessary. To many, in moderation, it does no injury; but what is moderation? It often injures the nervous system, interferes with digestion, depresses the mental as well as the physical, and muddles the intellectual powers. If you *must* smoke, let it be the mildest tobacco, and as seldom as possible—only after eating, and never in the morning or till after lunch. This view about alcohol and tobacco will not, perhaps, meet general approval, but I undertook to tell you what is good for you and not what is merely agreeable. They are not always synonymous. These are matters that I have studied for many years. I have heard all the arguments on either side, have made my own observations and some experiments, and what I have told you is the result.

The drinking water is a matter of great importance, and attention to obtaining it in a state of purity is a prominent hygienic duty. Its impurity is the reputed cause of many diseases, and probably none is more potent for evil. A variety of complaints—cholera, fevers, diarrhœa, dysentery, goitre, and some others, including certain parasitic diseases, with which the human race may be affected—are ascribed to it. Water should always be filtered, and it is well to boil it; heat dissipates certain impurities, and tends to render others innocuous. An ordinary sand or charcoal filter is therefore a desirable addition to your household furniture. The sources of water supply are wells, tanks, rivers, and rain; wherever you take it you should ascertain its probable freedom from contamination by organic impurities before you drink it. Ærated drinks are not always free from impurities, for the water of which they are manufactured may not have been either filtered or boiled.—Take note of turbidity, smell, taste, as these indicate the possible nature of substances with which water may be impregnated. I cannot go into the subject of analysis, but I may just say that you should submit it to the following simple tests:—It should be free from smell and ought to be soft, dissolving soap easily; if not, there are too many lime salts present in it. It should be clear,

sparkling, and colourless; if it is not so, you may improve it by boiling, filtering, and allowing the sediment to settle. Sediment will be deposited by the addition of a little alum, or other astringent. Boiling destroys the activity of organic matter, and the ova of most of the lower forms of life. It deposits lime salts and so diminishes the hardness. A green tinge suggests the presence of vegetable matter, not necessarily dangerous; a yellow tinge, sewage contamination or peaty matter, sometimes iron —the first dangerous, the latter two not so. It is firmly believed by the natives that the standing water of pools, jheels, swamps, and tanks in the forests, the Terai, and malarious localities, are charged with fever poison in solution, and it is not impossible that they may be right. Always avoid such water, however thirsty you may be; at all events, never drink it till it has been boiled and filtered. Water may be contaminated by lead or other mineral poison, but you are hardly likely to meet with this impurity. Iced water is much drunk in India; the ice comes from America, or is artificially made. You may drink it with impunity. I have no recollection of seeing any one suffer from drinking iced water in a hot climate. Indeed, in the great heat it is good, for it tends to keep down the body temperature.

Filters are simply made with charcoal or sand, but they require frequent cleansing from the organic and other impurities they collect.

The use of water externally is of the greatest importance in hot climates, for cleanliness and for keeping the action of the skin free and unimpeded. Generally, cold bathing in the morning is best, but you must be guided by its effects: if it causes a pleasant glow and reaction, it agrees with you; if it depresses or makes you chilly, use it tepid, or you may bring on congestion of the lungs, liver, spleen, or other internal organ. Generally it will be found to invigorate, and nothing is more refreshing than a mussuck or gurrah of cold water poured over the head and body, either in the early morning or when you come in from a hard day's work, marching, shooting, riding, surveying, or

the like. The swimming bath is also very good—many stations have them. You may bathe in lakes or other still water, or even rivers, but not in the heat of the day; only be sure there are no alligators, leeches, or other noxious creatures to hurt you. Too much bathing should be avoided, and the temperature of the bath must be suited to the idiosyncracy of each individual. The hot bath will often give great relief in feverish states or other conditions of indisposition, but avoid it as a daily habit if you can.

As regards your dwelling, you should select one on a raised site, well drained, ventilated, and as far as possible from low, damp, or swampy ground. Bungalows are one-storied buildings, not always constructed with much regard to sanitary requirements, but are frequently the only houses you can obtain. When you *can* get one with a second storey, always do so, and sleep upstairs. Your room should be large—1800 cubic feet is the smallest space consistent with a due supply of air, and it is better to have much more; see that it has the proper amount of door and window space, but avoid draughts and currents of air. At nights, however great the heat, you should have a light blanket to draw over you, and it is well to wear night-clothing of light flannel or cotton. The punkah is necessary during hot nights —without it sleep is often impossible. It is very important that you should have good sleep, for nothing in the hot weather more refreshes or invigorates you! Early rising is the rule in India, and I advise you to conform to the usual practice. The morning is the time for exercise and fresh air, and you will do well to devote an hour or so to walking or riding. Exercise is essential to health, and you should make it a duty to obtain it. The use of the Indian clubs, which you may soon learn from the natives, is a good supplement to other exercise; it developes the chest and gives vigour to the muscular system. Exercise prevents langour and inactivity, keeps away liver congestion and dyspepsia. Do not overdo it, especially during the great heat, as over-fatigue and exhaustion may predispose you to disease. Let me advise you also to exercise your minds as well as your bodies. Intellectual torpor and stag-

nation are as much to be dreaded as physical, and nothing is so likely to keep you out of irregular habits as mental occupation. Your duties will pretty fully employ you, and you will not have been long in India ere you find that most men have as much, if not more, to do than they can thoroughly do justice to. But you are not always to be on duty, and it is right that you should have some resource in intellectual exercise and amusement. You will have little difficulty in getting books, and it will add to your happiness and well-being if you read them, and also if you study the native languages, and cultivate any accomplishment, such as music or drawing. For my own part I can say that I always found time for something beyond my mere professional work, and I can safely add few were more fully occupied. But I did more in the way of reading and research when in the full swing of my professional work in Calcutta than I ever did at any other period of my life. The habit of work grows, and one learns to utilize every spare moment. Physical health is so much influenced by, indeed, I may say dependent on, mental health, that the integrity of one often implies that of the other.

Depend on it that he who leads a well-regulated and fully-occupied life, and who submits to self-discipline, is the healthiest and happiest man. I would caution you against giving way to the insidious growth of irregular habits—the more dangerous that you had probably no original desire for them. If not on your guard, you may find that, unconsciously, they have obtained an ascendancy exceedingly difficult to get free from.

I have said nothing, I trust, that will tend to make you over solicitous about yourselves. A proper amount of precaution is right, but coddling and anticipating disease is much to be deprecated. Nothing is worse for a man in unhealthy places or in times of epidemic disease than a state of nervous expectancy and apprehension,—it is as unwholesome as it is unmanly. Keep your minds cool and collected, observe the ordinary rules for preserving health, avoid exposure to direct causes of disease, and leave the rest to Providence; but be careful about conservancy, see that all

bath-room refuse and discharges of disease are carefully removed. Do not imagine every headache is sunstroke or apoplexy, every pain in your stomach cholera or dysentery, every twinge in your side liver. Most frequently such things are merely transient disturbances, and pass away. Neither frighten nor physic yourself into real disease. There is no greater mistake than to be always dosing for imaginary or even for real complaints; and there are sufficient real causes for anxiety without worrying yourselves about imaginary ones. Having given you some idea of how you should avoid disease, I must now say a few words on the diseases themselves, and tell you what you can do in emergency for yourselves or others until you can obtain medical aid. But it is impossible in the time at my disposal to do more than give you a few general principles.

Few pass a year in India without learning what fever is, and that there are several forms of the disease. There is simple febricula, that lasts for a few days and passes away, perhaps never to return, without doing any injury. Its symptoms are malaise disordered secretions, headache, muscular pains and weakness, loss of appetite; it may be due to the first effects of heat on a constitution not inured to it, to irregularities of diet, and quite probably to malaria. The treatment is simple. Remain at home—take a dose of aperient medicine, cooling drinks, and a light diet; saline diaphoretics during the hot stage, a few grains of quinine after it has passed away. If it do not pass away in a few days it will require other management. No one knows what malaria *is*, but most people in India know what it *does*. I fear one must admit that no part of India is quite exempt, though many are worse than others. Heat, moisture, vegetable matter, and its putrefactive changes, certain soils or geological formations, seem to determine the thing or the condition, whichever it is, that causes ague or intermittent and remittent fever.

The miasm is most pernicious in certain districts, and where there is dense vegetation, such as the Terai, it gives rise to what is called jungle fever. Marshes, swamps, and submontane belts of forest, or low jungle, where the subsoil

water lies near the surface, such as the Himalayan Terai (I wish I had time to tell you more about it), are often deadly and uninhabitable for a great part of the year; the worst season everywhere being in the drying up months, when heat is dessicating the ground, and liberating malaria. Dry arid tracts of land are not exempt, for it is bad enough in many districts where it cannot be attributed to surface moisture—but it may be that subsoil damp is the cause. I may say, in passing, that there is no more fertile source of disease than subsoil water and imperfect drainage. It would appear that cultivation and living on the ground will in time improve its salubrity, but beware of newly-disturbed ground, or of clearance of vegetation, for there emanations may arise, from which the most pernicious malarial fever may result. You have an example of the consequences of bad surface drainage, improper distribution, or retention of water, in the fever that has been for years depopulating a district (Burdwan) in Bengal. There is a grand field for engineering skill and science in the sanitary arrangements of India, and I commend it to your consideration. Malarial miasmata are influenced by locality, winds, heat, &c. One is more liable to suffer on the leeside of a swamp, for example, than to windward of it. A belt of trees intervening will protect to a certain extent, and a covering of the slightest gauze, such as a musquito curtain, will guard the sleeper at night. It is more potent near the ground than at an elevation, hence you should always sleep in an upper storey, or in a bed well raised from the ground, if you can get one. People constantly exposed to malaria become to a certain extent inured to it; but ague or fever are not the only modes in which malaria declares its action. Broken health, anæmia, cachexia, enlarged spleen, neuralgia, are even more frequent results, and it often happens that persons may be driven away by ill health from malarious districts who have never had fever, though they may have suffered severely in other ways. Such persons not unfrequently get fever after they leave the district and return to Europe. In cases of malarious anæmia, with enlarged spleen,—a common result of fever,—

a mixture of quinine gr. iij., and sulphate of iron gr. ii., taken two or three times a-day, for some weeks (keeping the bowels regular), will be of benefit, but nothing more imperatively than this demands change of climate. The fever caused by malaria is known as intermittent, because it comes at intervals in a paroxysmal form, with a cold, a hot, and a sweating stage, according to the intervals at which these recur it is quotidian, tertian, quartan, or it may come at irregular and longer intervals.

These distinct intervals are rather the exception than the rule in India. The form it assumes appears to depend on the intensity of the poison and the peculiarity of the constitution, and perhaps of the locality. In some cases it becomes what is called remittent, and in others, assuming a more severe aspect, it passes into a condition like that of typhus, and is very dangerous. These are the forms generally known as jungle fever.

The treatment is that of ordinary fever; in the first stage —salines, and after the hot stage has passed away, five to ten grain doses of quinine every fourth hour, which should be continued for sometime, until the physiological effect of the drug is produced, as recognized by deafness and singing in the ears. It is well to take a dose an hour or so before the paroxysm is expected, for it may prevent it altogether. —It is impossible to dwell longer on this now, for I have still much to say on other matters.

There are other forms of fever—the enteric, which may, like the disease in Europe, be due to specific contagion from drains, sewers, or the like, or it may be a form of climatic disease ;—the true typhus, and the relapsing fever. But these, I fear, it is quite impossible to enable you to deal with, in a few brief remarks,—though, generally, I may say a modification of the treatment I have already mentioned would be desirable, to support the strength and allay fever.

Another complaint that you may be called on to deal with is dysentery, known by the intense pain and difficulty with which the bowels act, and the passage of mucus and blood.

This should at once be treated with 15 or 20 grains

of ipecacuanha in water, and repeating it in three or four hours for three or four times. This, if done early, will nearly always give relief and arrest mischief. Avoid all solid food. Afterwards take Dover's powder, 5 or 6 grains, twice or thrice a day, with 2 or 3 grains of quinine ; use hot fomentations ; keep perfectly at rest in bed, and, if possible, communicate with the nearest medical officer. Any sudden relaxation of the bowels should at once be arrested by a dose of astringent medicine and ten drops of laudanum. It may be that it was really not necessary to do this, and you may have to correct the effects by a dose of castor oil afterwards ; but diarrhœa sometimes means incipient cholera, and it is an error, if one at all, on the right side, to check it. Cholera is recognised by the vomiting and purging of watery fluid, which goes on rapidly, and soon exhausts the patient ; cramps and lividity soon set in, and death may result in a few hours. On the first symptom of diarrhœa give laudanum x. to xx., or chlorodyne xv. to xxx. drops, and repeat in two or three hours if necessary, or give cholera medicine frequently, as directed. Apply turpentine stupes, or mustard poultice, to the abdomen ; give champagne or brandy and iced water, and endeavour to support the courage and the strength of the patient; keep him warm, rub the limbs and body with ginger powder. Send for the nearest doctor without delay. In times of cholera prevalence it is well to avoid taking aperients, especially salines ; be careful not to eat unripe fruit or indigestible matter ; be particular about purity of the water. Avoid over fatigue or any exhausting work, and keep your mind as free from despondency and alarm as possible. At once check any diarrhœa, and avoid all food or drink that might tend to increase or to cause it, and be very careful that all cholera discharges are removed, disinfected, or destroyed, and prevented from having access to the water.

A propos of malaria and exposure to heat, I may here say a few words on shooting and hunting, during which you are likely enough to be exposed to the risks of both. Snipe shooting has much to answer for ; it is a common form of sport, and easily obtained im many parts of India. Avoid

it in the heat of the day, and altogether in notoriously malarious localities, and when you do indulge, change your wet dress after you come out of the swamp as quickly as possible, and on no account sit down to tiffin in your wet clothes. Drink as little as possible, and I recommend you to adopt cold tea as your beverage. When you are shooting in jungly and swampy malarious places, it is well to take 3 or 4 grains of quinine and some food before you start. In shooting from the howdah or on foot in the hot weather, which is the time for tiger and big-game shooting, carefully protect your head and spine, smoke little, and keep to cold tea. Heavy tiffins, with beer, champagne, brandy and soda, and rich dishes, are as destructive of sport as they are of health. If you will take these precautions you may endure heat, and exposure with a fair chance of escaping mischief. The exercise is good for you, and the pursuit of big game is not only most interesting, but it helps to develop your physical and mental energies.

A few words about exposure to heat and its effects. It may cause faintness or exhaustion, or more serious effects on the brain and nervous system, inducing excitement, unconsciousness, and if very severe, death. In the event of an attack, remove the person into the shade, loosen all tight dress, and apply cold water to the head; if he be pale and faint, a dash or two of cold water, it may be, will rouse; if the prostration be profound, that, or a stimulant may do good, but it should be administered with caution; quiet rest and the recumbent posture will soon restore, but the sufferer should be taken home, and not exposed again to the heat. If the face be flushed and the skin hot, apply cold water and ice, if you have got it, over the head and body, remove him to a cool place, administer an aperient, and keep the bowels open. Perfect rest and quiet should be secured, and if recovery is not complete and rapid, send for medical aid. An intense form of fever, with head symptoms, may be the result, which requires active and prompt treatment of the nature I before described to you in reference to ordinary fever. Of course this is but the merest outline of what you should do, but this much, if done promptly, will be

of great service, and may save life. One thing I may caution you against—it is that you should never in such cases attempt to bleed the sufferer. Your remedies are ice to the head, cold affusion, perfect rest and quiet in the coolest shelter you can find.

A few words about liver disease, which begins most probably by pain in the right side and shoulder, fever, nausea, constipation, and a semi-jaundiced skin. Free purgation, with a calomel pill, compound jalap powder, or sulphate of magnesia, fomentations over the side, and very spare diet, excluding meat and alcohol, will probably give relief, and may stave off inflammation and consequent abscess. If the case is severe, seek the nearest medical aid. For ordinary bilious derangements, with foul tongue, nausea, sallow face, eyes tinged with bile, a couple of colocynth pills, and a dose of salts next morning, with abstinence from animal food and stimulants, and avoiding exposure to heat, will remove it; but beware of any mode of life that may appear to tend to increase the disposition to these attacks, for they may end in congestion—perhaps inflammation of the liver. As to diarrhœa—if it occur when you are otherwise in good health, and if you think it may be due to any indiscretion in diet—take a dose of oil, or of Gregory's powder, to expel the peccant matter, keep to a light diet for a few days, and all will be well. Diarrhœa *may* be the precursor of an attack of cholera; if that disease is about, check it at once, for reasons formerly given; if from other causes, simple astringents, such as chalk and catechu, with restricted diet, may be sufficient to remove it. Chronic diarrhœa of the tropics requires change of climate and treatment that I cannot describe here.

In connection with functional derangement of the liver, I would call your attention, having been asked to do so, to a condition which not unfrequently depends on it, often amounts to serious disease, and is always a source of trouble and annoyance to the sufferer. I refer to hæmorrhoids (piles). These are vascular growths (small tumours) connected with the mucous membrane of the lower bowel, either within the orifice, or just external to it. They are of

two kinds, the internal and external, and depend on a distended, congested, and varicose state of the hæmorrholida blood vessels and mucous membrane, and are much influenced by the condition of the liver, as the vessels implicated form part of the so-called portal circulations, by which is meant the blood that, flowing through certain veins, enters a large trunk called "Portal," the branches of which are distributed to the liver; the blood brought by it being that from which bile and other products are separated. In certain abnormal states of the liver in which the free circulation of the blood is impeded, congestion of these vessels is apt to result, and to give rise to this troublesome affection.

Whilst small and incipient, they are comparatively harmless, but when they increase in size, as they are apt to do, and when they give rise to mucous discharge and hæmorrhage, from rupture of the distended vessels, they are prejudicial, and should be removed or otherwise actively treated.

The *internal* are generally the most troublesome, but both are liable to fits of congestion, inflammation, and at times, hæmorrhage.

The loss of a small quantity of blood in this way is often attended with a delusive sense of relief, and the sufferer feels better for it; but this cannot go on long without causing serious mischief to the health. It is best to try and avoid having the affection at all, and the way to do so is to keep the bowels regular, avoid luxurious and slothful habits, take plenty of exercise and a moderate diet, bathe the parts with cold water, and avoid excess of food and stimulants of all kinds.

I trust none of you suffer in this way, or have any tendency so to suffer, but if you do, that you will not go to India, until relieved. A sedentary life may have induced it, if so get rid of it before going to a hot climate, where the complaint is likely to increase. I have already cautioned you, in respect of food and drink, in regard to the well-being of the liver—the same precautions apply for similar reasons in this case.

Lead regular lives, avoid excesses of all kinds, take regular exercise, and keep the bowels open.

In case either external or internal piles should have proceeded so far as to cause pain or hæmorrhage, then rest is imperative ; saline aperients should be taken ; cold and astringent applications or injection may be required ; apply tannic acid or alum in water, or an ointment made of gall nuts ; but as soon as possible repair to the nearest medical officer for aid. When the swelling and tension are severe, hot fomentations with solution of acetate of lead and opium may give relief.

The frequent losses of blood, even in small quantities, are very prejudicial; they cause anæmia and debility, a blanched and pallid appearance, with breathlessness and exhaustion. They should never be allowed to continue ; and it is most probable that an operation for their removal will be necessary. You should lose no time in seeking medical aid. When from any cause, such as errors of diet or stimulants, cold or wet, the piles become inflamed, you should take a dose of calomel, gr. iii., opii gr. i., and follow it with a dose of castor oil next morning. Foment, and keep on your couch for a time.

If the pain and tension are very severe, a leech or two, or puncture of the distended tumour, may be expedient. But in such cases, if possible, get medical aid.

For those who have a tendency to the affection, careful living, plain food, regular exercise, the use of some mild laxative, such as confection of pepper, and senna or Ward's paste, sulphur and cream of tartar, rhubarb with ipecacuanha and soda, may be very useful, and the application of the gall ointment already mentioned. The use of the enema of cold water every morning after the action of the bowels is often of great service.

These precautions, necessary everywhere, are especially so in hot tropical and malarious climates, where there is a natural tendency to liver derangement, and therefore I have offered these few remarks as especially applicable to those who are to live in India, and because I received a hint that they might be specially useful.

Of course there are many other diseases and accidents to which people in India are liable. I have only been able to

mention those that most specially call for notice, and it would be quite impossible for me to do more in the brief opportunity afforded by one lecture.

I must add a few words on snake bites, musquitos, centipedes, scorpions, &c.

The order Ophidia has three divisions : O. colubriformes, innocuous ; O. colubriformes venenosi, and O. viperiformes, venomous.

The poison apparatus of a snake consists of a gland, situated in the temporal region, which secretes a clear, slightly viscid fluid, that is poured through a duct into a grooved fang situated on a movable maxillary bone, capable of erection and reclination, to a greater extent in viperine than in colubriform snakes, by the action of muscles which push forward the maxillary bones, raise the fang, at the same time compress the gland, eject the poison through the duct into the groove in the fang, and thus hypodermically inject it into the bitten part.

The fangs are longer, more curved, more movable, and more formidable in viperine than in colubrine snakes—they are deciduous, and when lost by accident or shed are quickly replaced by reserve fangs that lie loose in a fold of mucous membrane.

Viperine snakes can recline or erect each fang independently of the other. This power is limited in colubrine snakes. The poison is secreted in considerable quantities ; half a drachm may be collected from a fresh and vigorous cobra. It is very deadly in its action, probably more active in some snakes, quantity for quantity, than in others, and varying in activity in the same species or individual, according to season, temperature, state of health, etc. It acts most rapidly when injected into the blood ; but it can be absorbed through mucous and serous membranes, as seen by its poisonous effects when applied to the eye, the stomach, the peritoneum. It may neither be applied to the lips nor taken into the stomach with impunity, and sucking a snake bite is by no means free from danger, though if the saliva be quickly ejected and the mouth washed, the danger is diminished. It contains an active principle, and is very

nearly like albumen in composition. It is most active on warm-blooded creatures, but it takes effect in all. Poisonous snakes are very insensible to the venom of other species of poisonous snakes. A cobra or viper is not poisoned by another cobra or viper's venom, though probably affected by that of other species. But all other living creatures succumb to it.

The action of the poison is local and general.

Local.—Pain, partial paralysis of the bitten part, ecchymosis, swelling, and if death does not rapidly follow, infiltration of other and distant parts, cellulitis, sloughing.

General.—Depression, fainting, nausea, vomiting, hurried respiration, exhaustion, lethargy, paralysis, loss of consciousness, hæmorrhagic discharges, coma, convulsions, death. If the quantity of poison injected be small or its nature feeble, the symptoms may give way and recovery take place. Snake poison acts by paralyzing the nerve centres—sometimes the peripheral distribution of the nerves, and by altering the constitution of the blood. It takes effect through the circulation, and if inserted into a large vein it will cause almost instant death.

There is reason to believe that the numerous agents that have been recommended as antidotes are useless, and have no such properties as those ascribed to them.

The rational treatment of snake poisoning is the endeavour to prevent the entry of the virus into the circulation, to support the failing nerve force, and to aid elimination.

There is often uncertainty as to the kind of snake, its condition, and the extent to which its fangs were used. The shock or depression which follows a snake bite may be in a measure due to fright, and will, on reassurance, pass away. The marks of two well-defined punctures attest the insertion of two fangs, and if the snake has not been seen, may enable one to form an opinion as to its character. Many of the innocuous snakes are fierce, and bite vigorously, but their numerous teeth leave different marks to those of the poison fangs.

A few innocent snakes have the anterior maxillary teeth developed like poison fangs, but bites from them are not very likely to occur.

It may be well to note some of the characters that distinguish the venomous snakes. The form and arrangement of their teeth, and an examination of the mouth, will always reveal the true character. In the mouth of a venomous colubrine snake, such as cobra or bungarus, two well-developed fangs will be observed, one on either side, and close behind it there may be seen one or two smaller teeth ; there is no row of teeth along the outer side of the mouth, but a double row will be found on the palatine surface.

In the viperine and crotaline snakes, a large fang will be found on either side, and a double palatine row. There are no small fixed teeth behind the fangs as in colubrines, but in a fold of mucous membrane at the base of the fangs, both in vipers and colubrines, a set of loose reserve fangs will be found.

In Hydrophidæ the fangs are arranged like those of the cobra, but are very minute, and no reliance can be placed on any mark made by them—bites very rare.

Harmless snakes have a double row of equal or nearly equal-sized teeth in the maxillary and palatine bones.

There is nothing (except the hood in Najadæ) in colubrine snakes peculiarly characteristic of their venomous character ; at first sight it is difficult to say whether they are poisonous or not. Indeed, several of the innocent have a more repulsive aspect than poisonous species.

The viperine and crotaline snakes are remarkable for their broad arrow-shaped heads, often without shields, their thick bodies, and short tails. They have thick, swollen-looking lips, from the large fangs underneath them ; and the nasal pits in Crotalidæ are very conspicuous. The Hydrophidæ are recognised by their compressed bodies and tails. Their peculiar heads, which in some species is very small, the valvular nostrils, and the absence, except in one genus, Platurus, of ventral scales. They are obviously aquatic, and are always found in the sea or washed up on the shore. Space will not admit of more than a general indication of the genera and geographical distribution.

These belong to the families Elapidæ, Hydrophidæ,

Viperidæ, Crotalidæ. Elapidæ is a large group, widely spread over India. It contains the truly venomous snakes, such as ophiophagus, naja, bungarus.

Family Hydrophidæ.—These are sea snakes, and probably all very poisonous. They have a wide range of distribution in the Indian and Australian seas, from Madagascar west to Panama east.

Genera.—*Hydrophis* has numerous species, and probably many yet undescribed. They are found in the Indian seas about Formosa, and in Australia. *Platurus:* 2 species; Bay of Bengal. *Enhydrina:* 1 species; Bay of Bengal. *Pelamis:* 1 species; Indian and all Eastern Seas.

Family Viperidæ.—The daboia of India and Ceylon, echis of India, are deadly vipers.

Family Crotalidæ.—The pit vipers. Trimeresurus, several species, in India, Ceylon. They are poisonous, but not nearly so much so as are the vipers. Peltopelor, Hypnale. Halys, in Himalayas. These are not very poisonous; though they may cause severe symptoms, are hardly able to destroy life.

Snake bites are very dangerous in India, but happily are very uncommon in Europeans, though twenty thousand natives die yearly from this cause. The venomous snakes of India are the ophiophagus, cobra, bungarus (black or steel coloured, and yellow-banded) Russell's viper, and echis carinata. There are also some others comparatively rare, and the salt-water snakes, which are all poisonous. The cobra, the krait, the Russell's viper, and the echis viper are the snakes most likely to be met with, and their bites are very deadly. I will quote some remarks that I have made elsewhere on this subject, and some general instruction how to treat the bites.

As soon as possible after a person is bitten by a snake, apply a ligature, made of a piece of cord, round the limb or part at about two or three inches above the bite. Introduce a piece of stick, or other lever, between the cord and the part, and by twisting tighten the ligature to the utmost. Apply two or three ligatures above the first one at intervals of four or six inches, and tighten them also.

After the ligature has been applied, scarify by cutting across the puncture to the depth of a quarter of an inch with a penknife or other cutting instrument, and let the wounds bleed freely, or better still, excise the punctured part. Apply either a hot iron or live coal to the bottom of these wounds as quickly as possible, or some carbolic or nitric acid. If the bite be not on a finger or toe, or a part where a ligature could be applied, raise up the integument with the finger and thumb, and with a sharp penknife cut out a circular piece as big as a finger nail round each puncture, *i.e.*, round the points of your finger and thumb, to the depth of a quarter or half an inch. Then apply the hot iron to the bottom of the wounds. Give fifteen drops of liquid ammonia diluted with water immediately, and repeat it every quarter of an hour for three or four doses, or longer, if symptoms of poisoning appear; or give hot brandy, or other spirit, with an equal quantity of water, about an ounce of each (for an adult) at the same intervals. Should no symptoms of poisoning appear in half-an-hour after the application of the ligatures, they should be relaxed or the part will perish from gangrene; if they should appear, the ligatures should not be relaxed until the person be recovering from the poison or until the ligatured part be cold and livid.

Suction of the wounds may be beneficial, but as it may be dangerous to the operator, it cannot be enjoined as a duty. If, notwithstanding, symptoms of poisoning set in and increase, if the patient becomes faint or depressed, unconscious, nauseated, or sick, apply mustard poultices or liquid ammonia on a cloth, over the stomach and heart, continue the stimulants, and keep him warm, but do not shut him up in a hot stifling room or small native hut; rather leave him in the fresh air than do this. Do not make him walk about if weary or depressed, rouse him with stimulants, mustard poultices, or ammonia, but let him rest. If the person be first seen some time after the bite has been inflicted, and symptoms of poisoning are present, the same measures are to be resorted to. They are less likely to be successful, but nothing else can be

done. In many cases the prostration is due to fear; the bite may have been that of a harmless or exhausted snake, and persons thus bitten will rapidly recover under the use of the above measures. If poisoned, but, as is frequently the case, not fatally, these measures are also the most expedient; if severely poisoned, no others are likely to be more efficacious. People should be warned against incantations, popular antidotes, and loss of time in seeking for aid. The measures suggested are no doubt severe, and not such as under other circumstances should be entrusted to non-professional persons; but the alternative is so dreadful that, even at the risk of unskilful treatment, it is better that the patient should have this chance of recovery.

Protect yourselves from musquitos by using a curtain,—you are sure to be bitten pretty freely at first, and I hardly know of any remedy. The irritation may be allayed by a cooling lotion of goulard; the application of sal-volatile and eau de cologne may give relief; and it is said that camphor, penny royal, and lemon juice, if rubbed on the skin will keep them away—which is best of all.

Centipede and scorpion poisoning are comparatively rare. The pain is severe, and in an unhealthy state of the constitution it might be dangerous; but generally a cooling lotion—ipecacuanha or ammonia, applied externally, seem to neutralize the action, and allay pain. There are many other things that I might have said to you had time permitted. I have selected that which seemed to me most important, and may, I hope, have some effect in directing your attention to the means of preserving health, which, I repeat, there is every reason to hope will be preserved if you will only, from the date of your arrival in India, observe certain precautions and rules which, though simple enough, are very important. I have placed before you specimens of the clothing and head-dress, and other things that I recommend you to wear. Two valuable works on Domestic and Bazaar Medicines, by Dr Moore of Bombay, and Dr Waring of Madras; also a work on Snake Poisoning, by Dr Ewart, I recommend to you as part of your travelling library; and also a medicine chest of a simple and portable form, pre-

pared by that eminent pharmaceutist, Mr Squire, which would enable you to meet sudden emergencies. Of course I cannot pretend to direct you further than this, but with such hints as I have thrown out, and the simple instructions accompanying the drugs, you may be able to relieve suffering or save life until you can get further aid.

I am conscious that I have detained you too long, and, I fear, exhausted your patience, but trust what I have said may be of use; so it only remains for me, in conclusion, to wish you a long and prosperous career in the great country we have been discussing, and to which, as I think, most who have served there, look back with pleasure and satisfaction.

THE END.